

FORM PTO-1390 (REV 11-2000)	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER <b>36-1448</b>
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5) <b>09/869150</b> <small>unknown</small>
INTERNATIONAL APPLICATION NO. <b>PCT/GB00/00046</b>	INTERNATIONAL FILING DATE <b>7 January 2000</b>	PRIORITY DATE CLAIMED <b>19 January 1999</b> <b>15 April 1999</b>

TITLE OF INVENTION

**DATA SELECTION SYSTEM AND METHOD THEREFOR**

APPLICANT(S) FOR DO/EO/US

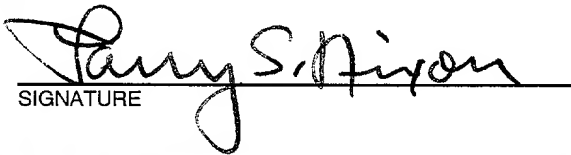
**WINTER et al**

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☒ The U.S. has been elected by the expiration of 19 months from the priority date (Article 31).
5. A copy of the International Application as filed (35 U.S.C. 371(c)(2)).
  - a. ☒ is attached hereto (required only if not communicated by the International Bureau).
  - b. ☒ has been communicated by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
  - a. ☐ is attached hereto.
  - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
  - b. ☐ have been communicated by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has **NOT** expired.
  - d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

**Items 11 To 20 below concern document(s) or information included:**

11. ☐ An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821-1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☐ Other items or information.

U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5) <b>09/869150</b>		INTERNATIONAL APPLICATION NO <b>PCT/GB00/00046</b>		ATTORNEY'S DOCKET NUMBER <b>36-1448</b>	
21. <input checked="" type="checkbox"/> The following fees are submitted:				<b>CALCULATIONS</b> PTO USE ONLY	
<b>BASIC NATIONAL FEE (37 C.F.R. 1.492(a)(1)-(5)):</b> -- Neither international preliminary examination fee (37 C.F.R. 1.482) nor international search fee (37 C.F.R. 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO .....\$1000.00 -- International preliminary examination fee (37 C.F.R. 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO.....\$860.00 -- International preliminary examination fee (37 C.F.R. 1.482) not paid to USPTO but international search fee (37 C.F.R. 1.445(a)(2)) paid to USPTO .....\$710.00 -- International preliminary examination fee (37 C.F.R. 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4).....\$690.00 -- International preliminary examination fee (37 C.F.R. 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4).....\$100.00  <b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>				\$	860.00
				\$	0.00
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 C.F.R. 1.492(e)).				\$	0.00
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total Claims	17	-20 =	0	X	\$18.00
Independent Claims	2	-3 =	0	X	\$80.00
MULTIPLE DEPENDENT CLAIMS(S) (if applicable)			\$270.00	\$	0.00
<b>TOTAL OF ABOVE CALCULATIONS =</b>				\$	<b>860.00</b>
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.					0.00
<b>SUBTOTAL =</b>				\$	<b>860.00</b>
Processing fee of \$130.00, for furnishing the English Translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 C.F.R. 1.492(f)).					0.00
<b>TOTAL NATIONAL FEE =</b>				\$	<b>860.00</b>
Fee for recording the enclosed assignment (37 C.F.R. 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 C.F.R. 3.28, 3.31). <b>\$40.00</b> per property				\$	40.00
Fee for Petition to Revive Unintentionally Abandoned Application (\$1240.00 - Small Entity = \$620.00)				\$	0.00
<b>TOTAL FEES ENCLOSED =</b>				\$	<b>900.00</b>
				Amount to be:	
				refunded	\$
				Charged	\$
a. <input checked="" type="checkbox"/> A check in the amount of \$900.00 to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. 14-1140 in the amount of \$_____ to cover the above fees. A duplicate copy of this form is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 14-1140. A duplicate copy of this form is enclosed. d. <input checked="" type="checkbox"/> The entire content of the foreign application(s), referred to in this application is/are hereby incorporated by reference in this application.					
<b>NOTE: Where an appropriate time limit under 37 C.F.R. 1.494 or 1.495 has not been met, a petition to revive (37 C.F.R. 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</b>					
<b>SEND ALL CORRESPONDENCE TO:</b>  NIXON & VANDERHYE P.C. 1100 North Glebe Road, 8 <sup>th</sup> Floor Arlington, Virginia 22201-4714 Telephone: (703) 816-4000					
				 SIGNATURE	
				<b>Larry S. Nixon</b> NAME	
				<b>25,640</b> REGISTRATION NUMBER	
				<b>June 25, 2001</b> Date	

JC03 Rec'd PCT/PTC 25 JUN 2001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

## In re Patent Application of

WINTER et al

Atty. Ref.: **36-1448**

Serial No.      **Unknown**

Group:

National Phase of: **PCT/GB00/00046**

International Filing Date: 7 January 2000

Filed: **June 25, 2001**

Examiner:

For: **DATA SELECTION SYSTEM AND METHOD THEREFOR**

\* \* \* \* \*

**June 25, 2001**

Assistant Commissioner for Patents  
Washington, DC 20231

Sir:

**PRELIMINARY AMENDMENT**

Prior to calculation of the filing fee and in order to place the above identified application in better condition for examination, please amend the claims as follows:

**IN THE CLAIMS**

Please substitute the following amended claims for corresponding claims previously presented. A copy of the amended claims showing current revisions is attached.

3. (Amended) A method according to claim 1 wherein the step of determining the value of the relevance parameter for each data file, for each sort statement, comprises the step of identifying the most relevant data file for each sort statement, assigning it a maximum relevance parameter value and determining respective normalised values for the rest of the data files based on said maximum relevance parameter value.

6. (Amended) A method according to claim 4 wherein the elements move in steps and a movement vector is determined for each step.

[illegible]

8. (Amended) A method according to claim 4 further comprising the step of applying scaling factors to the respective movement vectors according to the respective positions of the elements on the display means.

10. (Amended) A method according to claim 1 wherein the step of defining the or each sort statement comprises the step of displaying a list of available sort parameters on the display means and selecting a set of sort parameters from the list.

11. (Amended) A method according to claim 1 wherein the step of defining the or each sort statement site comprises the step of selecting a respective position on the display means which correspond to a point on the circumference of a circle.

13. (Amended) A method according to claim 1 wherein each element moves from its initial position towards a site which represents the most relevant sort statement for the respective data file.

14. (Amended) A method according to claim 1 further comprising the step of storing the selected data files.

15. (Amended) A method according to claim 1 further comprising the step of pre-selecting at least one sub-class of data files to be sorted.

16. (Amended) A method according to claim 1 further comprising the step of pre-formatting the data files to be sorted.

1. General Information	
Item	Value
1.1. Name of the Project	Project A
1.2. Date of Submission	2023-10-27
1.3. Author(s)	John Doe
1.4. Institution	ABC University
1.5. Supervisor	Prof. X
1.6. Co-Supervisor	Dr. Y
1.7. Title of the Thesis	Investigation of the Impact of Climate Change on Biodiversity
1.8. Abstract	This study aims to explore the effects of climate change on various species and ecosystems, focusing on the last decade.
1.9. Keywords	Climate Change, Biodiversity, Ecosystems, Species, Impact
1.10. Summary	The research involves data collection from various sources, including satellite imagery and field observations, to analyze the changes in biodiversity over time.
1.11. Objectives	1. To identify the key factors influencing biodiversity loss. 2. To assess the impact of climate change on different species. 3. To propose effective conservation strategies.
1.12. Methodology	The study employs a combination of qualitative and quantitative methods, including interviews with experts and statistical analysis of data.
1.13. Results	Initial findings suggest a significant correlation between rising temperatures and the decline of certain species populations.
1.14. Conclusion	The research highlights the urgent need for global action to mitigate climate change and protect biodiversity.
1.15. Acknowledgments	The author expresses gratitude to the funding agency and the research team for their support.
1.16. References	Smith, J. (2020). Climate Change and Biodiversity. <i>Journal of Environmental Science</i> , 15(2), 123-135.
1.17. Appendix	Appendix A: List of Species Monitored Appendix B: Data Collection Methods
1.18. Bibliography	See References section for a detailed list of cited works.
1.19. Glossary	Definitions of key terms used throughout the document.
1.20. Index	Index of topics and page numbers for easy navigation.

## REMARKS

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**Version with markings to show changes made.**"

The above amendments are made to place the claims in a more traditional format.

Respectfully submitted,

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**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

3. (Amended) A method according to claim 1 [or claim 2] wherein the step of determining the value of the relevance parameter for each data file, for each sort statement, comprises the step of identifying the most relevant data file for each sort statement, assigning it a maximum relevance parameter value and determining respective normalised values for the rest of the data files based on said maximum relevance parameter value.

6. (Amended) A method according to claim 4 [or claim 5] wherein the elements move in steps and a movement vector is determined for each step.

8. (Amended) A method according to [any one of claims 4 to 7] claim 4 further comprising the step of applying scaling factors to the respective movement vectors according to the respective positions of the elements on the display means.

10. (Amended) A method according to [any preceding claim] claim 1 wherein the step of defining the or each sort statement comprises the step of displaying a list of available sort parameters on the display means and selecting a set of sort parameters from the list.

11. (Amended) A method according to claim 1 wherein the step of defining the or each sort statement site comprises the step of selecting a respective position on the display means which correspond to a point on the circumference of a circle.

13. (Amended) A method according to [any preceding claim] claim 1 wherein each element moves from its initial position towards a site which represents the most relevant sort statement for the respective data file.

- 5 -

DATA SELECTION SYSTEM AND METHOD THEREFOR

This invention relates to a system and method for accessing data and in particular concerns a system and method for accessing large quantities of data stored  
5 in a computer based record system.

Modern computer based record systems often contain large multi-dimensional databases which contain very large quantities of data. The utility of these systems often depends on the speed and accuracy with which selected data can be accessed in the database. Computer based data access systems capable of searching large  
10 databases and retrieving files and records according to one or more user defined parameters are known as are systems capable of searching and analysing data in such databases to provide statistical information about that data. In these systems data files or records are usually selected for retrieval or analysis on the basis of user defined logic parameters which relate to specific data fields in the data files or  
15 records being searched. User defined logic statements are also used to select data files or records in a similar way, that is to say, statements consisting of two or more user defined logic parameters in combination with a logic operand. In this way the data files or records are selected on a binary yes or no basis.

The ability to identify patterns in large quantities of data can be of significant  
20 commercial benefit, particularly to a commercial organisation that generates a large quantity of customer related data on a regular basis. For example, the call database of a large telecommunications company will contain valuable hidden information regarding groups of customers who have similar usage patterns etc. By identifying customers according to such patterns valuable customer information can be obtained  
25 and customer profiles developed.

A problem associated with large computer databases is that it can be extremely difficult to identify hidden patterns in the data using data access systems of the above mentioned type. One reason for this is that a detailed understanding of complex mathematical logic and a knowledge of the database structure is usually  
30 required before a user can define the appropriate search parameters and statements to investigate possible patterns in the data. Another reason is that the crude binary selection process prevents the data files or records being selected on a more discriminatory basis, for example according to the extent that the data agrees or



disagrees with the search parameter or statement. A further reason is that the selected data can be difficult to interpret when presented to the user, particularly when multiple field data files or records are concerned. There are a limited number of ways in which the selected data files or records can be presented including tables, lists, graphs, charts etc. When multiple field data files or records are presented different comparisons between the various files or records for each of the data fields may be necessary in order for a pattern to be identified in the selected data. Multiple field data files or records also present a similar problem if the selected data is sorted according to a value associated with one or more of the data fields since the data must be presented for comparison for each respective data field into which the data is sorted.

In the context of the present invention it is to be understood that the term data file relates to any group of data that can be linked together by a common parameter. In the above mentioned call database a data file may comprise all the call data relating to a particular customer, for example.

According to an aspect of the invention there is provided a method of selecting information stored in a data storage system, said method comprising the steps of:-

- defining at least one sort statement;
- determining the value of a relevance parameter for each data file in the stored information in respect of the or each sort statement;
- defining at least one sort statement site on a display means, wherein a sort statement site represents a respective sort statement;
- representing the data files as elements on the display means;
- effecting movement of at least one element from an initial position on the display means towards one or more sort statement sites, the movement of respective elements being determined in accordance with the relevance parameter for their associated data files in respect of each statement so that differences in the data files cause the elements to move relative to one another, thereby to provide a visual indication of the data files being sorted; and
- selecting at least one data file according to the position on the display means of its respective element.

This allows each of the data files to be represented visually as an element moving on the display means. Patterns in the data are readily recognisable since each element moves in accordance with the relevance of the sort statements to the data file it represents. In this way differences between respective data files can be  
 5 observed on the display means as relative movements between the respective elements. Thus, hidden patterns in the data are easily identified by observing groups of elements moving in a similar way on the display means. The selecting means allows these groups of elements to be selected so that the respective data files can be accessed and analysed.

10 A major advantage of the method of the present invention is that the movement of the elements is determined by the relevance of the respective sort statements to the data files. In this way the data files are represented according to the extent they agree or disagree with the sort statements. This overcomes the problem of selection based on binary sort statements. In this respect the system is  
 15 suitable for users with only moderate levels of mathematical skill. A further advantage is that a plurality of sort statements can be applied to the data files simultaneously such that the elements move according to the effect of all the sort statements on the respective data files. This allows the user to create logic statements according to the position of the respective sort statements on the display means.

20 Preferably, said method further comprises the step of accessing data in a selected data file.

In preferred embodiments, the step of determining the value of the relevance parameter for each data file, for each sort statement, is normalised. This is done by identifying the most relevant data file for each sort statement, assigning it a  
 25 maximum relevance parameter value such as 100% and determining respective normalised values for the rest of the data files based on said maximum relevance parameter value. This enables the respective movements of the elements to be readily determined.

The step of moving the elements may comprise the step of determining a  
 30 movement vector for each element based on the magnitude of the normalised values of the respective data file and the direction of relevant sort parameter sites relative to the element. In this way the position of the sort statement sites affects the

movement of the elements. Accordingly, the sort statement sites can be positioned to investigate any hidden pattern in the data records.

Preferably, the step of determining a movement vector for each element comprises the step of determining a component movement vector for the element in  
 5 respect of each sort statement based on the magnitude of the respective normalised value of the respective data file for the sort statement and the direction of the respective sort statement site to that element, and summing the component movement vectors.

In preferred embodiments, the elements move in steps and a movement  
 10 vector is determined for each step. In this way the movement of the elements can be animated on the display means to provide improved visualisation of the data files being sorted. In addition, by recalculating the movement vector for each step the elements follow a more accurate trajectory on the display means which provides for improved identification of patterns in the data files.

15 Preferably, the display means comprises an array of pixels and respective movement vectors determine which pixels respective elements are to be moved to in each step. This optimises the above mentioned advantages.

Conveniently, the method further comprises the step of applying scaling factors to the respective movement vectors according to the respective positions of  
 20 the elements on the display means. In this way the velocity of each element is further dependent on its position on the display means.

In preferred embodiments, the step of applying scaling factors comprises the step of selecting a scaling factor area distribution. Accordingly, different scaling factors may be applied to elements at different positions on the display means  
 25 according to the area distribution selected. In this way an element may be made to speed up or slow down as it moves on the display means.

Preferably, the step of defining the or each sort statement comprises the step of displaying a list of available sort parameters on the display means and selecting a set of sort parameters from the list. In this way the data files can be sorted according  
 30 to a pre-determined list of sort parameters.

Conveniently, the step of defining the or each sort statement sites comprises the step of selecting a respective position on the display means which corresponds to

a point on the circumference of a circle. This enables the movement vectors to be more readily determined.

In preferred embodiments, the initial position of the elements is defined at the centre of the circle. In this respect the elements may be moved from an initial position  
5 which is equi-distant from all sort parameter sites.

Preferably, each element moves from its initial position towards a site which represents the most relevant sort statement for the respective data file. In this way it is possible to identify patterns in the data by observing the speed and trajectory of the respective elements to their respective site.

10 Conveniently, the method further comprises the step of storing selected data files. This allows the selected data records to be analysed further according to further sort statements and parameters.

In preferred embodiments, the method further comprises the step of pre-selecting at least one sub-class of data files to be sorted. This enables the number of  
15 data files to be reduced.

Preferably, the method further comprises the step of pre-formatting the data files to be sorted. This provides for a faster method and further optimises the above mentioned advantages.

According to another aspect of the invention there is provided a system for  
20 selecting information stored in a data storage system, said system comprising:-

a display means;

a sort statement generator for generating at least one sort statement;

a position generator for positioning one or more sort statement sites on the display means;

25 a data processor for determining the value of a relevance parameter for each data file in the stored information in respect of the or each sort statement;

a visual signal processor for representing the data files as elements on the display means and for simulating movement of at least one element from an initial position on the display means towards one or more sort statement sites in  
30 accordance with the relevance parameter for the associated data file in respect of the or each sort statement so that differences in the data files cause the elements to move relative to one another and provide a visual indication of the data files being sorted; and

a data selector for selecting at least one data file according to the position on the display means of its respective element.

This enables the above mentioned method to be readily implemented in a data access system.

5       The invention will now be described by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is a functional block diagram showing part of a client-server arrangement for the system of the present invention;

Figure 2 is a functional block diagram showing a client-server network for  
10       implementing the present invention;

Figure 3 is a flow chart of a data access method according to an embodiment of the invention;

Figure 4 is a schematic representation of a display means displaying a user interface for use with the present invention;

15       Figure 5 is a schematic view similar to Figure 4 showing an initial position of unsorted data elements on the display means; and

Figure 6 is a schematic view similar to Figure 4 showing the elements in a partially sorted position.

With reference to Figures 1 and 2, a system embodying the present invention  
20       comprises a client-server communication network arrangement 150. A server 152 is connected to a plurality of client terminals 156 in the network by means of a plurality of data links 158. The client terminals are conventional computer systems provided with display means in the form of a screen 160. The client terminals are personal computers (PCs) capable of being networked together in a client-server environment.  
25       The server 152 has a data link 162 to a main network connection 164 which is linked to a read only database 166. In this embodiment the database 166 is a call database of a large telecommunications company and contains all the call records of a group of customers for a given accounting period. A further database 168 comprises data from the database 166 which has been restructured by the server 152, or other processor  
30       means, into a series of customer related files for use in the method of the present invention.

The server comprises a plurality of processors 170, a read only database 172 storing user interface data, a read only database 174 storing data relating to system

operation and user options and a read/write database 176 for storing user defined data.

The data held in database 172 comprises data relating to the user interface used for presenting information to the user on the display means of the client terminal  
 5 156. This data comprises the definition of the screen layout, data relating to the presentation of user options and data relating to all user interface functions including data identification, selection and access for example. The data held in the database 174 comprises data relating to user selection options including the sort parameters available to be used in data sorting and selection, scaling factors and the like for use  
 10 in a visual presentation and data filter parameters available to reduce the amount of data prior to sorting, for example. The database 176 stores data that has either been defined by the user such as sort statements comprising one or more of the parameters in database 174, or data that the user has selected for analysis, for example.

15 The processors 170 comprise a first processor 180 which is capable of reading data from database 166 and restructuring the data into a series of customer files for subsequent use. The restructured data is stored in the database 168 by the processor 180. A second processor 182 provides a data filter. Data from the database 168 is filtered in processor 182 according to user defined filter parameters  
 20 selected by the user of the system. The user defined filter parameters are stored in the database 176 following user selection and accessed by the processor 182. The filter data is stored in the database 168 by the processor 182. A third processor 184 in the form of a sort statement generator is provided for generating one or more sort statements, that is a sort statement comprising one or more sort parameters selected  
 25 by the user from the sort parameter options in the database 174. The processor 184 stores the user defined sort statements in the database 176. A fourth processor 186 is provided for determining the value of a relevance parameter for each customer file in respect of each sort statement based on the relevance of the sort parameter to the customer file. In this respect processor 186 is capable of reading the post-filtered  
 30 customer files from database 168 and storing the relevance values to the database 176. A fifth processor 188 comprises a position generator for establishing a position on the display means to be associated with each sort statement. The fifth processor receives data from the database 174 regarding the options the user may use in

defining the positions. These options are available to the user through the user interface. The user also has the option of defining the position manually in which case selection of the positions is controlled by the processor 188. A sixth processor 190 provides a visual signal processor for representing the customer data files as elements on one or more pixels on the display means of the user's client terminal 156. The sixth processor is capable of receiving data from the fourth and fifth processors and moving the elements by a number of pixels towards one or more of the sites in order to visually represent the data files being sorted. The visual signal processor 190 has a motion pause function for pausing the motion of the elements on the display means and a zoom function for zooming in on a particular area of the display means. A seventh processor 192 comprises a data selector for user defined selection of customer data files according to the position of the elements on the display means. The data selector allows the user to select one or more records at a time for immediate access of the data or for storage in the database 176 for subsequent access. An eighth processor 194 provides a data access processor for accessing the data selected by the user.

With reference now to Figure 3, the flow chart represents a data selection method according to an embodiment of the invention for identifying patterns in data held in a computer database. In one embodiment the method is implemented on the computer based system comprising a client-server network as described above.

In the call database 166 the call records comprise data fields relating to the time, duration, destination, type, cost, etc, of the call together with a field for a unique customer identification code. The customer identification code is provided for cross-referencing to a schedule in the database for identifying the customer making the call. The schedule includes customer details such as name, address, city, county, postal district, ISDN connection?, etc.

In the first step 10 in the flow chart the data held on the call record database is restructured into a series of much smaller customer files. The database is restructured so that each customer file includes static data comprising the customer data previously held in the customer schedule and transaction data comprising the call records for that customer. Step 10 is a pre-processing step for restructuring the data into a more appropriate format for use in the subsequent steps and is carried out

independently of the end user. In this regard, step 10 is carried out independently of the steps which define the data access method of the present invention.

Once the data has been restructured, the user is asked to define a data filter for reducing the amount of data to be processed. In step 12 the user is presented  
5 with a menu of available options on the display means. The options relate to the fields in the customer schedule of the call database. This step enables sub-classes of customers to be selected. For example, if the user is only interested in accessing data relating to customers in a certain postal district the filter is defined according to the postal district of interest. At this stage the user can select as many sub-classes  
10 as desired. Once the filter has been defined the appropriate customer files are selected in step 14.

The user then defines a number of sort statements in step 16 for sorting the customer data into groups based on individual customer call patterns. In this step the user is again presented with a menu of available options on the display means. These  
15 options relate to the fields in the customer schedule of the call database and the fields in the call record transaction data. The sort statements are defined according to the options selected by the user. Each sort statement comprises one or more sort parameters which relate to one or more of the data fields. For example, a first sort statement may concern the number of calls a customer has made to a particular  
20 destination during certain hours of the day and of a certain duration, a second sort statement may concern the number of calls to a different location in the same time period but of a longer duration, a third statement may concern the total cost of calls in a given period and a fourth statement may concern whether the customer has an ISDN connection. In this respect any number of sort statements can be defined using  
25 sort parameters relating to data in both the static and transactional data fields of the customer files. Once the sort statements are defined they are stored at step 18 as a single file.

The relevance of the sort statements to each of the customer files is determined in step 20. In this step, the customer files are read from the memory and  
30 compared sequentially with the sort parameters in the processor. The comparison in step 20 depends on the structure of the sort parameter statements, that is to say whether the statements relate solely to the static data, the transactional data or both. If a sort statement relates solely to the static data the comparison is relatively



straightforward since the sort parameters are compared on a binary basis with the static data of the file to determine whether the file is relevant or not to that statement. If the sort statement comprises parameters which relate to static data and parameters which relate to transactional data, the relevant static data of the file is first compared with the relevant static data sort parameters before the transaction data of the file is compared with the relevant transaction data sort parameters. That is to say each file is passed through a data filter to determine whether its static data complies with the static data sort parameters prior to comparison with the transactional data. If the static data of a file does not comply, further processing of the file is halted for that sort statement. If there is compliance or the sort statement consists exclusively of sort parameters which relate to the transactional data, the transactional data is compared with the transactional data sort parameters. This comparison involves counting the number of call records which comply with the transactional data sort parameters in the sort statement.

The above process is repeated for each sort parameter statement for each customer file. Once all the files have been compared the value of a relevance parameter is determined for each data file in respect of each sort statement, that is the files are assigned values representing the relevance of the sort statements to respective the files. If a sort statement comprises only sort parameters which relate to static data the value of the relevance parameter for the sort statement will be either 100% or 0%, that is yes or no. For example, if a sort statement were framed to ask the question "does the customer have an ISDN connection" the outcome would be either yes or no. If on the other hand the sort statement comprises sort parameters which relate to transactional data the value of the relevance parameter for the sort statement will have a value between 0% and 100%. The process of determining the value of the relevance parameter for a sort statement comprising transactional data sort parameters to a customer file involves the step of identifying the most relevant file for that sort statement, that is the file having the most records relevant to that statement, and then determining a normalised percentage value based on the number of records counted for the file and the number of records counted for the most relevant file. For example, if a sort statement is framed to ask the question "total number of calls under 3 minutes" and a file comprising 66 calls is found to be the most relevant a file comprising 33 calls will have a relevance value of 50%. The

most relevant file will have a value of 100% indicating that it is very strongly associated with the sort statement. Thus, all the files are given a percentage value corresponding to how strongly associated they are with each of the sort statements defined in step 16. This data is stored for further analysis in step 22. Alternatively,

5 the step of determining the value of the relevance parameter for a sort statement in respect of each file involves the step of determining a value based on the number of transactional records counted for the file and the total number of transactional records in the file. For example, if the sort statement is framed to ask the question "total number of calls under 3 minutes", a file comprising 33 calls of less than 3

10 minutes out of a total of 100 calls will have a relevance value of 33%.

Patterns in the data are investigated by the user according to the method steps that follow. In step 24 all or selected ones of the sort statements are visually represented on the display means. As shown in Figure 4, the sort parameters are allocated a respective site 100 on the display means corresponding to a point on the

15 circumference of a circle 102. The positions of the respective sort statement sites are determined either interactively by the user or automatically by a position generator in the system, but in either case the positions are capable of being moved around the circumference by the user if desired. The sites are distinguished from each other by the use of different colours or shapes etc, which also relate the sites to their

20 respective sort statements by means of a legend displayed on the display means.

At this stage each of the customer files stored in step 22 is represented as an element 104 on the display means at an initial position 106 corresponding to a pixel or group of pixels at the centre of the circle.

Once the user is content with the position of the respective sites, movement

25 of the elements is effected by a user command in step 26. The elements move from the initial position 106 towards the sort parameter sites. Movement of the elements is determined according to the relevance of the selected sort statements to the respective customer files as determined in step 20, and the relative position of the sites to the elements. Differences in the data held on the customer files causes the

30 elements to move relative to one another. In this way the user is presented with a visual indication of the customer files being sorted according to the sort statements defined in step 16.

By way of analogy, the sites can be considered as magnets attracting the elements. The elements are attracted to the sites according to the values determined in step 20 for the respective customer files in relation to the respective sort statements. In this way, an element representing a file that is strongly associated

5 with one of the sort statements will appear to be strongly attracted to the site associated with that statement. Accordingly, an element's movement may be influenced by more than one of the sites such that differences in the data in the customer files cause the elements to move at different speeds and along different trajectories on the display means.

10 The elements move in steps on the display means according to respective resultant movement vectors determined for each movement step. Each element has a component movement vector associated with each site. The direction of the component movement vector corresponds to the direction of the site in relation to the element. The magnitude of the component movement vector corresponds to the

15 value assigned in step 20 to the customer file represented by the element in relation to the sort statement represented by the site. A maximum movement per step representing a pre-determined number of pixels on the display means is associated with each of the sites such that the magnitude of the respective component vectors represent a corresponding number of pixels according to the respective percentage

20 values assigned in step 20. The resultant movement vector of an element is the vector sum of the respective component movement vectors of the element.

The resultant movement vector of an element determines the position on the display means the element is to be moved to in the movement step. In the following steps the directions of the component vectors are determined from the new positions

25 of the elements.

The component movement vector of each element with respect to each site is determined according to the following considerations:-

where the co-ordinates of the site are (X,Y);  
 the co-ordinates of the element are (x,y);

30 the value assigned to the element for the site in step 20 is A%; and  
 the maximum movement of the element in one step is movement constant k;

then;

movement in x direction =  $kA(X-x)/\sqrt{(X-x)^2 + (Y-y)^2}$ ; and

movement in y direction =  $kA(Y-y)/\sqrt{(X-x)^2 + (Y-y)^2}$ ;

- 5            wherein the net resultant movement vector is the sum of movements due to all the sites.

          The elements continue to move until they come to rest either at a point of equilibrium where the component movement vectors balance or at a site the element is most strongly associated with, that is to say the site associated with the most  
10 relevant sort statement for the element as determined in 20. In this respect it will be understood that the actual movement of the elements in 26 is of more importance to the user than the final position of the elements. Since all the elements move simultaneously the system and method of the present invention allow the user to identify patterns in the data held on the database by identifying groups of elements  
15 which move together on the same or similar trajectories.

          The system is further provided with selection means so that the user can interactively select groups of elements in step 28. In addition pause means are provided so that the elements can be selected either while they are moving or when movement is temporarily suspended on the display means by the user. Once an  
20 element or group of elements have been selected in step 28 the user is able to access the static and data relating to the transactional data in the customer files represented by the selected elements in step 30.

          With reference now to Figures 4 and 5, in one example of the method of the present invention one of the sort statements is defined in 16 to ask the question  
25 "percentage of calls to destination A". This sort statement is visually represented at site 108 on the perimeter of the circle 102 in step 24. In a similar way a second sort statement is defined to ask the question "percentage of calls to destination B". This statement is visually represented at site 110. Finally, a third statement is defined to ask the question "percentage ISDN calls". This sort statement is visually represented  
30 at site 112. In this example the sort statements sites 108, 110 and 112 are equally spaced about the circumference of the circle. As shown in Figure 5, the elements 104 are initially positioned at the centre of the circle occupying a single pixel or group of pixels prior to movement in step 26.

As can best be seen with reference to Figure 6, when the elements are moved in step 26 individual elements move relative to one another. The position of the elements in Figure 6 represents say one hundred movement steps. A first element 114 represents a customer file comprising transaction data comprising 25% of calls to destination A, 0% of calls to destination B and 0% of calls by ISDN. Element 114 thus moves towards the sort statement site at 108 at a rate of 25% of the predetermined maximum number of pixels per step. A second element 116 represents a customer file comprising transaction data comprising 50% of calls to destination A, 25 % of calls to destination B and 0% by ISDN. Thus, element 116 is simultaneously attracted to site 108 at a rate of 50% of the maximum number of pixels per step and to site 110 at a rate of 25% of the maximum number of pixels per step. A third element 118 represents a customer file comprising transaction data comprising 5% of calls to destination A, 5% of calls to destination B and 100% of calls by ISDN. Thus, element 118 is simultaneously attracted to site 108 by 5%, to site 110 by 5% and to site 112 by 100%. A fourth element 120 represents a customer file comprising transaction data comprising 40% calls to destination A, 40% of calls to destination B and 0% calls by ISDN. Element 120 is thus attracted to sites 108 and 110 by equal amounts and moves on a trajectory which represents a locus equidistant from sites 108 and 110. When the visualisation is complete element 120 will come to rest in a position indicated at 122 in Figure 6 which is mid way between the sites 108 and 110. Finally, a fifth element 124 represents a customer file comprising transaction data comprising 50% of calls to destination A, 50% of calls to destination B, and 50% of calls by ISDN. Element 124 is equally attracted to all three sites and since the sites are equally spaced, the resultant net movement vector is zero and therefore the element remains at the centre of the circle.

In Figure 6 it will be appreciated that those groups of elements moving along similar trajectories at similar speeds represent customer files having similar characteristics as far as the sort statements represented by the sites 108, 110 and 112 are concerned. In this way patterns in the data can be identified by the user selecting groups of similarly moving elements. In Figure 6, the user might select the group of elements in the region of element 114 by defining an outline 126 around the group of elements of interest. In the present embodiment the user moves a cursor over the display means to draw an outline around the elements. The elements are

selected by the user effecting a selection command once the outline is defined. Additionally or alternatively individual elements may be selected by the user identifying an element of interest by moving a cursor to the position occupied by the element on the display means and effecting a selection command. In order to assist  
 5 the user in selecting elements the system further comprises a zoom function which allows a selected window 134 on the display means to be enlarged for visual enhancement and displayed on the display means as shown at 130. The window 134 is defined by the user moving a cursor over the display means and indicating the area of interest by selecting opposing corners of a rectangular area to be enlarged.

10 Data in the selected data files is accessed either by being displayed on the display means at the time of selection in region 132, or is just identified and then stored for further sorting using a different set of sort statements or using the same sort statements but using different relative positions on the circle for the respective sites.

15 The system of the present invention allows the sites to be re-positioned and sort statements added or de-selected by the user even when the data is being processed and the elements are being moved in step 26. In this way, the user is able to control the visual sorting of the records if no discernible patterns emerge in the data at an early stage in the visual sorting process.

20 In a further embodiment of the present invention, the user is presented with a choice of scaling factors to be applied to the movement vectors for each movement step. In one example the scaling factors relate the strength of attraction of a site to the distance of the respective elements from the site so that the elements appear to speed up as they approach the site. This type of scaling is analogous to the attraction  
 25 of a magnet. Expressed another way the scaling factors define landscapes over the region of the display means, that is to say the scaling factors act as either positive or negative gradients with respect to the elements. In this way the speed of an element is affected by its position on the display means such that a positive gradient will cause the element to move slower and a negative gradient will cause the element to  
 30 move faster. An example includes a landscape of scaling factors based on concentric contour lines positioned about the centre of the circle 102 which represent either a valley or hill type distribution for slowing down or speeding up the motion of the

elements. The system preferably comprises a plurality of pre-defined scaling factor maps of the above sort for selection by the user.

It will be appreciated that the method and system of the present invention allows data to be sorted and accessed in a manner which readily allows patterns to be identified, particularly in large quantities of data such as the call database described. The ability to position and reposition the sort statement sites allows complex analytical questions to be framed. By selectively positioning the sort statement sites relative to one another data can be sorted according to logic AND, OR or Exclusive OR (XOR) combinations of the sort statements. For example, an element which moves rapidly to a site will occupy a position representing a logic XOR indicating that the data file is more strongly associated with that site; an element which is positioned between two sites will occupy a position representing a logic AND since the data file is equally attracted to both sites; and an element which remains substantially at the centre of the circle will be equally or NOT attracted to all the sites.

It will be appreciated that the present invention is not limited to the above mentioned embodiments but also includes variations to these embodiments which would be readily apparent to the skilled addressee. For example, the invention is not limited to accessing data in a call database. Indeed the invention is suitable for identifying patterns in any collection of data regardless of type or form. Moreover, it will be understood that the order of the method steps concerning the step of defining the sort parameter sites and the step of determining the relevance of the sort parameters to the customer data files can be interchanged without departing from the scope of the invention. Similarly, the step of displaying the elements can be interchanged with these steps without departing from the scope of the present invention.

## CLAIMS:

1. A method of selecting information stored in a data storage system, said  
5 method comprising the steps of:-  
    defining at least one sort statement;  
    determining the value of a relevance parameter for each data file in the  
stored information in respect of the or each sort statement;  
    defining at least one sort statement site on a display means, wherein a sort  
10 statement site represents a respective sort statement;  
    representing the data files as elements on the display means;  
    effecting movement of at least one element from an initial position on the  
display means towards one or more sort statement sites, the movement of respective  
elements being determined in accordance with the relevance parameter for their  
15 associated data files in respect of each statement so that differences in the data files  
cause the elements to move relative to one another, thereby to provide a visual  
indication of the data files being sorted; and  
    selecting at least one data file according to the position on the display means  
of its respective element.  
20
2. A method according to claim 1 further comprising the step of accessing data  
in the selected data file.
3. A method according to claim 1 or claim 2 wherein the step of determining  
25 the value of the relevance parameter for each data file, for each sort statement,  
comprises the step of identifying the most relevant data file for each sort statement,  
assigning it a maximum relevance parameter value and determining respective  
normalised values for the rest of the data files based on said maximum relevance  
parameter value.  
30
4. A method according to claim 3 wherein the step of moving the elements  
comprises the step of determining a movement vector for each element based on the



magnitude of the normalised values of the respective data file and the direction of relevant sort statement sites relative to the element.

5. A method according to claim 4 wherein the step of determining a movement  
5 vector for each element comprises the step of determining a component movement  
vector for the element in respect of each sort statement based on the magnitude of  
the respective normalised value of the respective data file for the sort statement and  
the direction of the respective sort statement site to that element, and summing the  
component movement vectors.
- 10 6. A method according to claim 4 or claim 5 wherein the elements move in  
steps and a movement vector is determined for each step.
7. A method according to claim 6 wherein the display means comprises an array  
15 of pixels and the movement vectors determine which pixels respective elements are  
moved to in each step.
8. A method according to any one of claims 4 to 7 further comprising the step  
of applying scaling factors to the respective movement vectors according to the  
20 respective positions of the elements on the display means.
9. A method according to claim 8 wherein the step of applying scaling factors  
comprises the step of selecting a scaling factor area distribution.
- 25 10. A method according to any preceding claim wherein the step of defining the  
or each sort statement comprises the step of displaying a list of available sort  
parameters on the display means and selecting a set of sort parameters from the list.
11. A method according to claim wherein the step of defining the or each sort  
30 statement site comprises the step of selecting a respective position on the display  
means which correspond to a point on the circumference of a circle.

12. A method according to claim 11 wherein the initial position of the elements is defined at the centre of the circle.

13. A method according to any preceding claim wherein each element moves  
5 from its initial position towards a site which represents the most relevant sort statement for the respective data file.

14. A method according to any preceding claim further comprising the step of storing the selected data files.

10

15. A method according to any preceding claim further comprising the step of pre-selecting at least one sub-class of data files to be sorted.

16. A method according to any preceding claim further comprising the step of pre-  
15 formatting the data files to be sorted.

17. A system for selecting information stored in a data storage system, said system comprising:-

a display means;

20 a sort statement generator for generating at least one sort statement;

a position generator for positioning respective sort statement sites on the display means;

a data processor for determining the value of a relevance parameter for each data file in the stored information in respect of the or each sort statement;

25 a visual signal processor for representing the data files as elements on the display means and for simulating movement of at least one element from an initial position on the display means towards one or more sort statement in accordance with the relevance parameter for the associated data file in respect of each statement so that differences in the data files cause the elements to move relative to one another  
30 and provide a visual indication of the data files being sorted; and

a data selector for selecting at least one data file according to the position on the display means of its respective element.

## ABSTRACT

## DATA SELECTION SYSTEM AND METHOD THEREFOR

5

The invention provides a system and method for sorting large data quantities of data in a database. The method is implemented on a computer based system and comprises the steps of defining a plurality of sort statements (16) by which the data is to be sorted; determining the relevance of each sort statements to each of the data  
10 files in the database (20); defining a site on a display means for each of the sort statements (24); representing the data files as elements on the display means; causing the elements to move from an initial position towards the sites according to the relevance of the respective sort parameters to the respective data files and the position of the sites relative to the respective elements to provide a visual indication  
15 of the records being sorted (26); selecting data files according to the movement of the respective elements (28); and, accessing data in the selected files (30).

Figure (4)

20

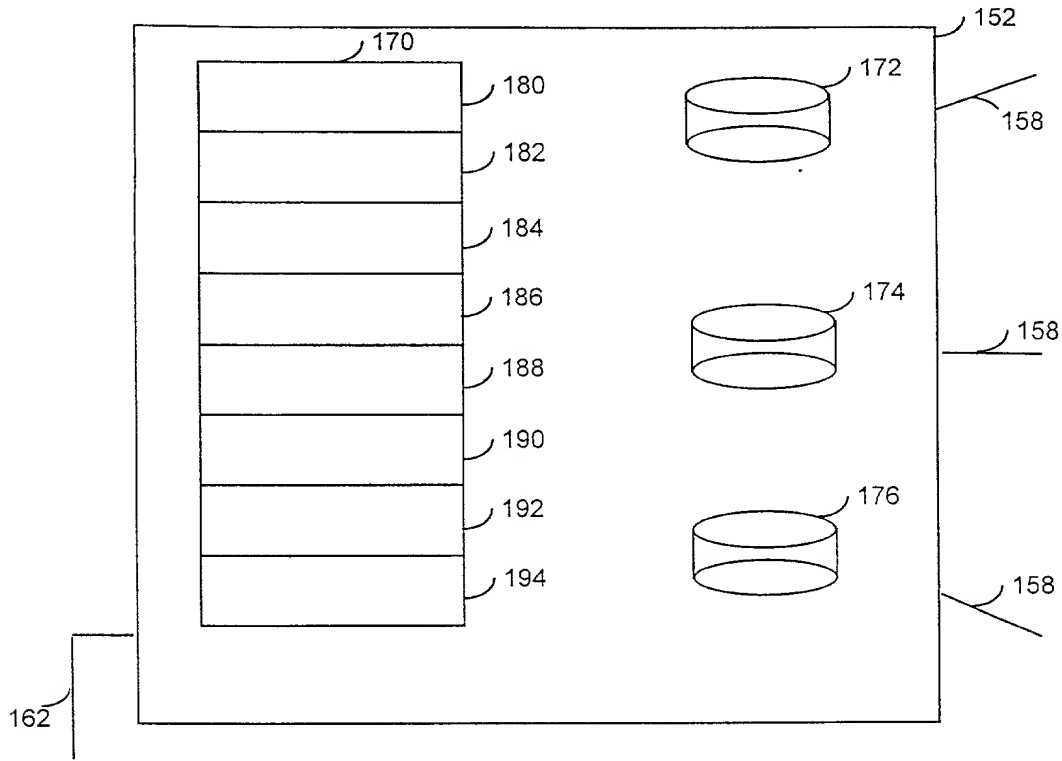
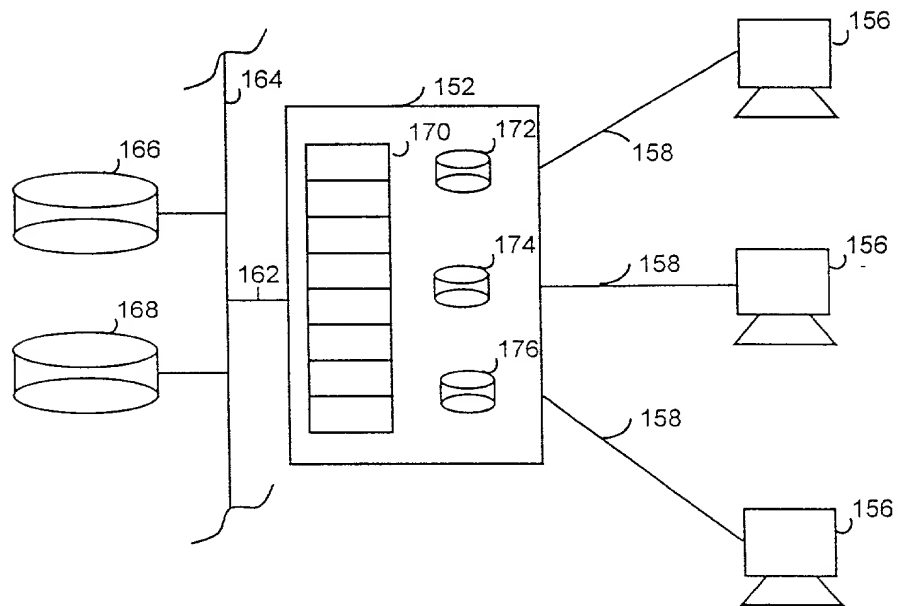


Fig 2



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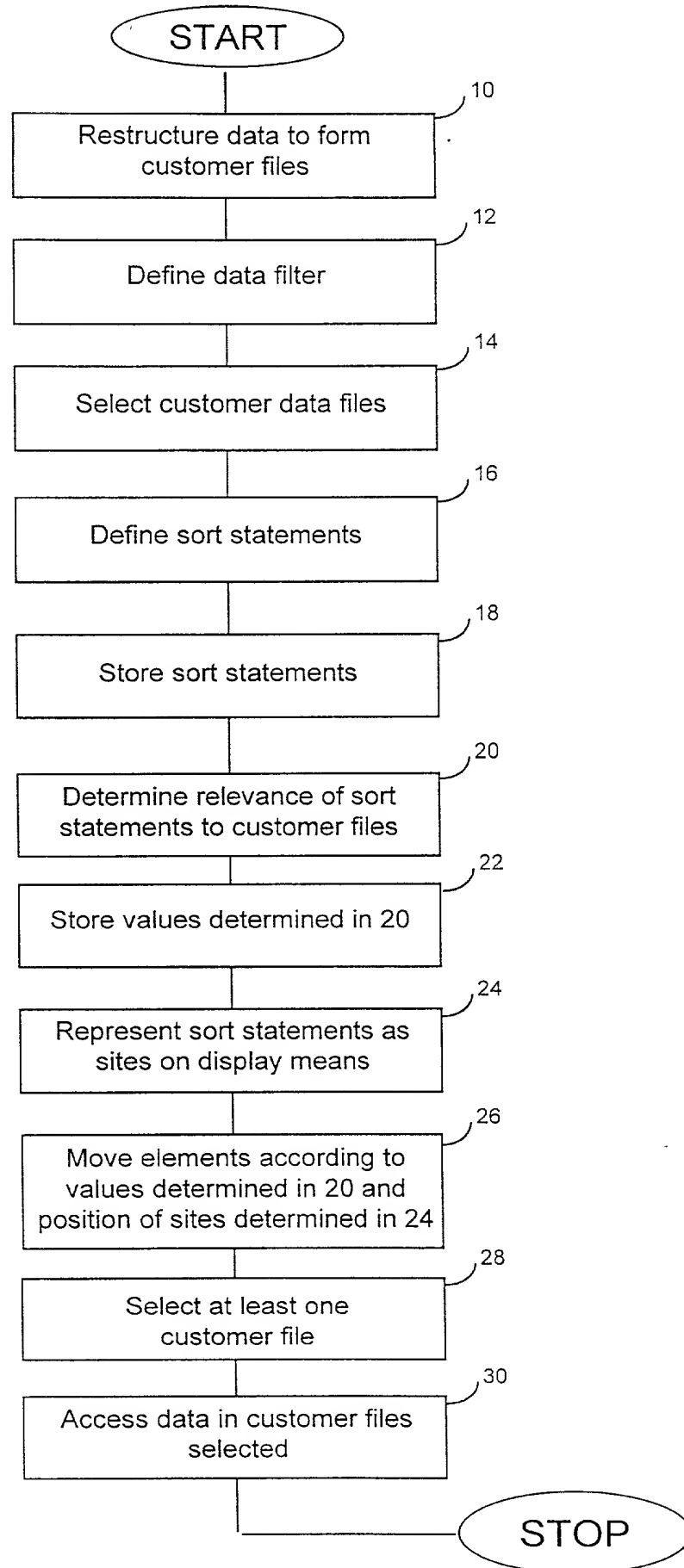


Fig 4

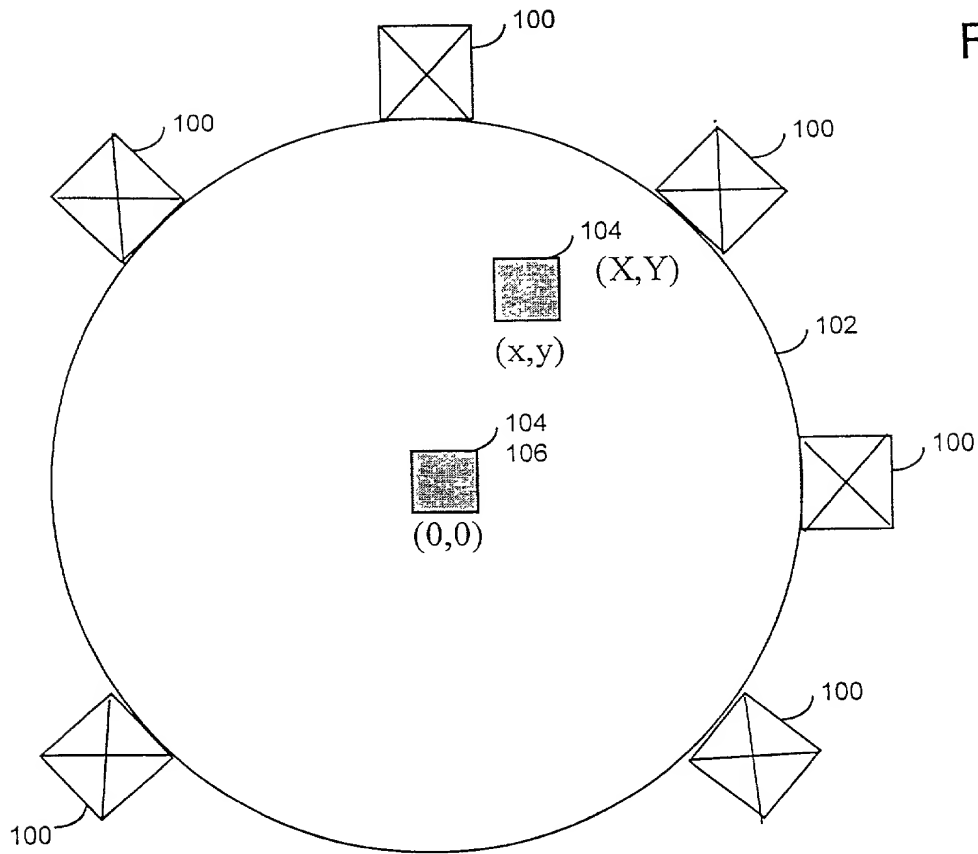


Fig 5

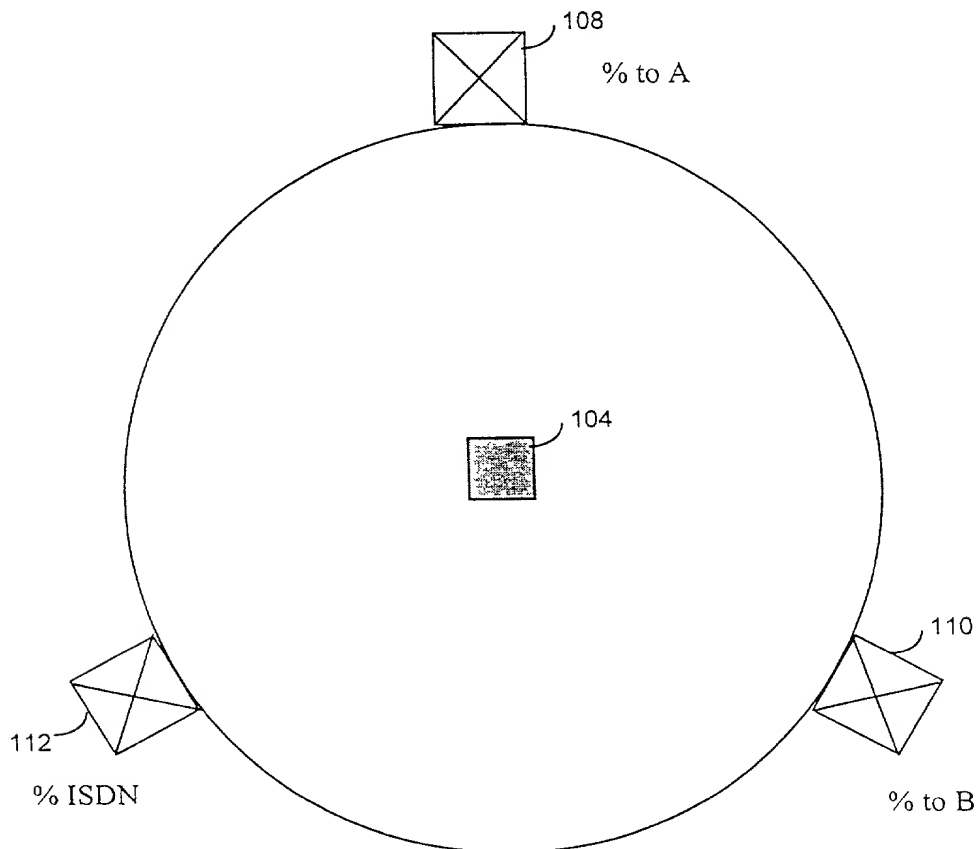
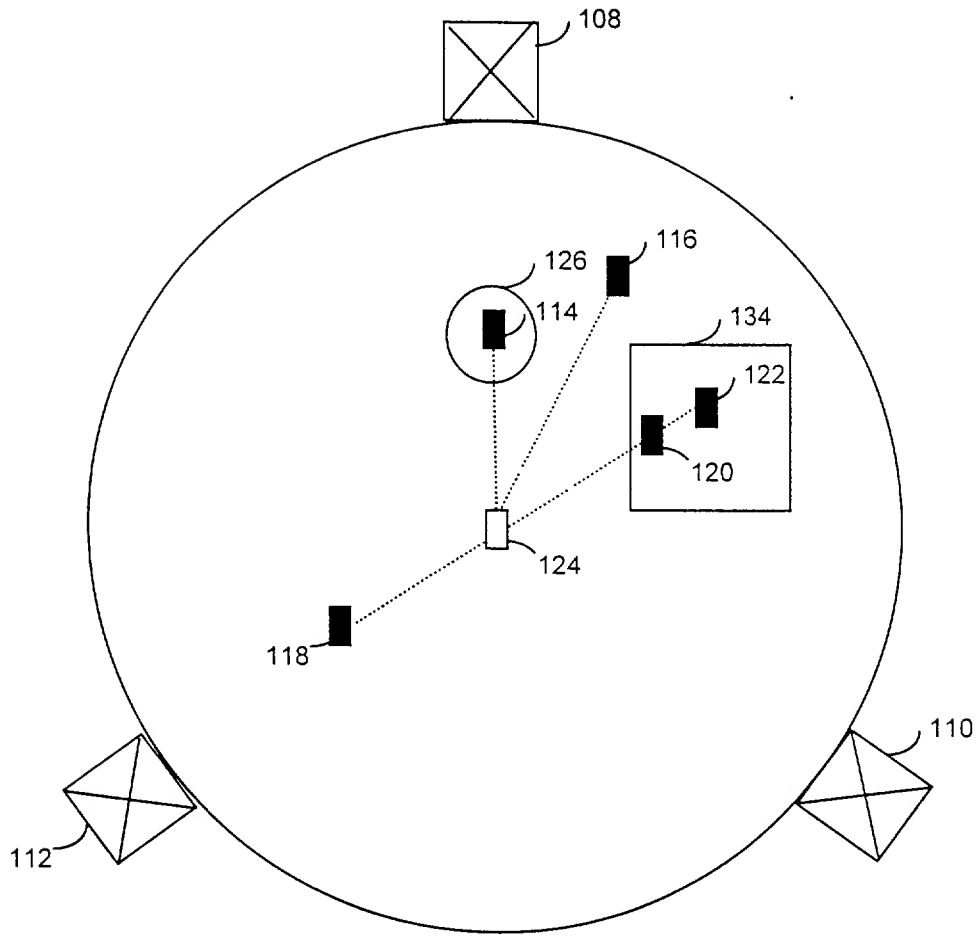


Fig 6



132

Customer XYZ

Address .....

.....

.....

10% calls to A

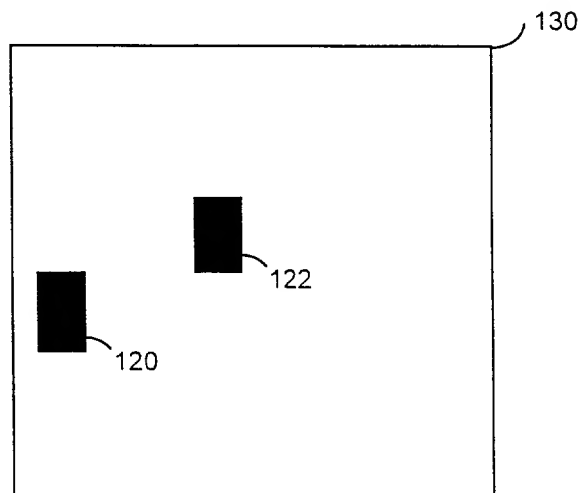
45% calls to B

30% before 13:00

12% by ISDN

.....

.....



**RULE 63 (37 C.F.R. 1.63)**  
**DECLARATION AND POWER OF ATTORNEY**  
**FOR PATENT APPLICATION**  
**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name, and I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**DATA SELECTION SYSTEM AND METHOD THEREFOR**

the specification of which (check applicable box(es)):

- ☐ is attached hereto  
☐ was filed on

as U.S. Application Serial No.

(Atty Dkt. No.

-)

☒ was filed as PCT International application No. PCT/GB00/00046 on 07 January 2000  
and (if applicable to U.S. or PCT application) was amended on \_\_\_\_\_

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with 37 C.F.R. 1.56. I hereby claim foreign priority benefits under 35 U.S.C. 119/365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed or, if no priority is claimed, before the filing date of this application:

Priority Foreign Application(s):

Application Number  
9901138.9  
99302928.9

Country  
GREAT BRITAIN  
EUROPE

Day/Month/Year Filed  
19 JANUARY 1999  
15 APRIL 1999

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

Application Number \_\_\_\_\_ Date/Month/Year Filed \_\_\_\_\_

I hereby claim the benefit under 35 U.S.C. 120/365 of all prior United States and PCT international applications listed above or below and, insofar as the subject matter of each of the claims of this application is not disclosed in such prior applications in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose material information as defined in 37 C.F.R. 1.56 which occurred between the filing date of the prior applications and the national or PCT international filing date of this application:

Prior U.S./PCT Application(s):

Application Serial No. \_\_\_\_\_ Day/Month/Year Filed \_\_\_\_\_

Status: patented  
pending, abandoned

**PENDING**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon. And on behalf of the owner(s) hereof, I hereby appoint NIXON & VANDERHYE P.C., 1100 North Glebe Rd., 8<sup>th</sup> Floor, Arlington, VA 22201-4714, telephone number (703) 816-4000 (to whom all communications are to be directed), and the following attorneys thereof (Of the same address) individually and collectively owner's/owners' attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith and with the resulting patent: Arthur R. Crawford, 25327; Larry S. Nixon, 25640; Robert A. Vanderhye, 27076; James T. Hosmer, 30184; Robert W. Faris, 31352; Richard G. Besha, 22770; Mark E. Nusbaum, 32348; Michael J. Keenan, 32106; Bryan H. Davidson, 30251; Stanley C. Spooner, 27393; Leonard C. Mitchard, 29009; Duane M. Byers, 33363; Jeffry H. Nelson, 30481; John R. Lastova, 33149; H. Warren Burnham, Jr. 29366; Thomas E. Byrne, 32205; Mary J. Wilson, 32955; J. Scott Davidson, 33489; Alan M. Kagen, 36178; Robert A. Molan, 29834; B. J. Sadoff, 36663; James D. Berquist, 34776; Updeep S. Gill, 37334; Michael J. Shea, 34725; Donald L. Jackson, 41090; Michelle N. Lester, 32331; Frank P. Presta, 19828; Joseph S. Presta, 35329 I also authorize Nixon & Vanderhye to delete any attorney names/numbers no longer with the firm and to act and rely solely on instructions directly communicated from the person, assignee, attorney, firm, or other organization sending instructions to Nixon & Vanderhye on behalf of the owner(s).

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Page 2

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